Fall 2015

ENCE 6097

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STRUCTURAL DYNAMICS

ENCE 6097

- INTRODUCTION
    - The Origins of Vibration Theory
    - Problems of Structural Dynamics
    - Fundamental Objective of Structural Dynamic Analysis
    - Types of Prescribed Loadings
    - Essential Characteristics of a Dynamics Problem
    - Methods of Discretization
    - Discrete Elements of Vibrating Systems
    - Newton's Second Law of Dynamics
    - D'alembert Principle
- SINGLE DEGREE OF FREEDOM SYSTEM (SDOF)
    - Undamped Free Vibration
    - Homework 1
    - Damped Free Vibration
        - Viscous Damping
        - Homework 2
        - Coulomb (Frictional) Damping
    - Undamped Forced Vibration
        - Periodic Force
        - Support Motions
    - Damped Forced Vibration
        - Periodic Force
            - Transmissibility
        - Support Motion
        - Vibration Isolation
        - Homework 3
- EXAM 1
- GENERAL PERIODIC EXCITATIONS / STEADY STATE RESPONSE
- VIBRATION UNDER GENERAL FORCING CONDITIONS
    - Response Under a General Periodic Force
    - Response Under a Periodic Force of Irregular Form
    - Response Under Nonperiodic Force
        - Convolution Integral
- RESPONSE SPECTRUM
    - For Base Excitation
- RESPONSE TO IRREGULAR FORCING CONDITIONS USING NUMERICAL METHODS

- Numerical Integration Methods
    - Finite Difference Method
        - Central Difference Method For Single Degree of Freedom Systems
        - Wilson Method
        - Newmark Method
- TWO DEGREE of FREEDOM SYSTEMS
    - Undamped Free Vibration
    - Equations of Motion For Forced Vibration
    - Forced Vibration Analysis
    - Homework 4
- MULTIDEGREE OF FREEDOM SYSTEMS (MDOF)
    - Influence Coefficients
        - Flexibility Coefficients
        - Stiffness Coefficients
    - Matrix Formulation of Equations of Motion
        - Equilibrium Equations
        - Compatibility Equations
        - Damping Coefficients
    - Natural Frequencies and Mode Shapes
- EXAM 2
    - Modal Matrix
    - Orthogonal;ity Properties of the Normal Modes
    - Generalized Mass and Stiffness Matrices
    - Modal Analysis - Principal Coordinates
    - Uncoupled Equations for Undamped Free Vibration
    - Uncoupled Equations for Damped Free Vibration
    - Rayleigh' Proportional Damping
    - Eigenvalue Solution Methods
        - Jacobi's Method
    - Equations of Motion - Forced Vibration
        - Force Excitation
        - Support Excitation
    - Modal Analysis (Modal Superposition Method)
        - Uncoupled Equations - Force Excitation
        - Uncoupled Equations - Support Excitation
- FINAL EXAM